KNOWLEDGE

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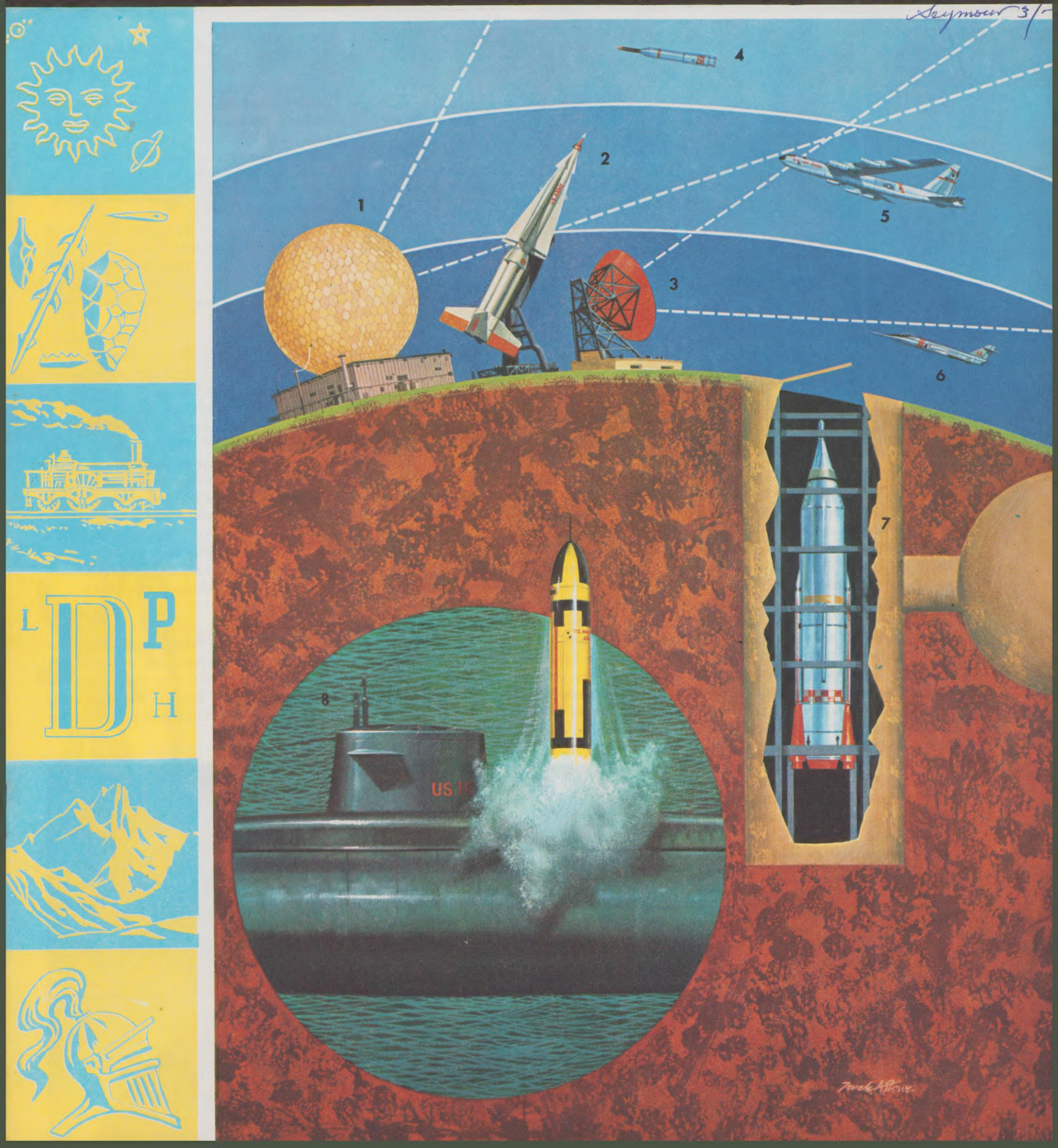

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DEFENCE

A giant radar screen at the BMEWS at Thule, in Greenland

SEVERAL terrifying stories have been written in the past few years about the last hours and minutes before the world plunged into a nuclear war. They are terrifying because they could so easily come true.

The leaders of the Western and Communist halves of the world have the power at any moment to unleash their nuclear forces. A quarrel or misunderstanding between the two sides could arise within a few hours to bring them to the point of war. Once that point was reached there would be only four minutes' warning before the first rocket landed on Britain and about 15 minutes for America. Nobody could stop the rockets then and the warning minutes would be used mainly to get the defender's bombers and rockets off on their way to strike back. And nobody could win. The warring countries would be laid waste. The rest of the world would be grievously affected by the destruction of the main centres of civilisation and, perhaps for generations to come, by the fall-out from the bombs.

Because the great powers have learned to understand and fear these facts about nuclear war, their defence is principally organised to try to make it impossible. Despite efforts to ease tension, like the recent ban on nuclear tests in the atmosphere, under the sea, and in space, the great powers do not really trust each other, so they race continually to make more powerful and efficient weapons to try to frighten each other off, concentrating principally on attack forces to keep the balance of power or fear. These forces are called 'the deterrent'.

Deterrent forces

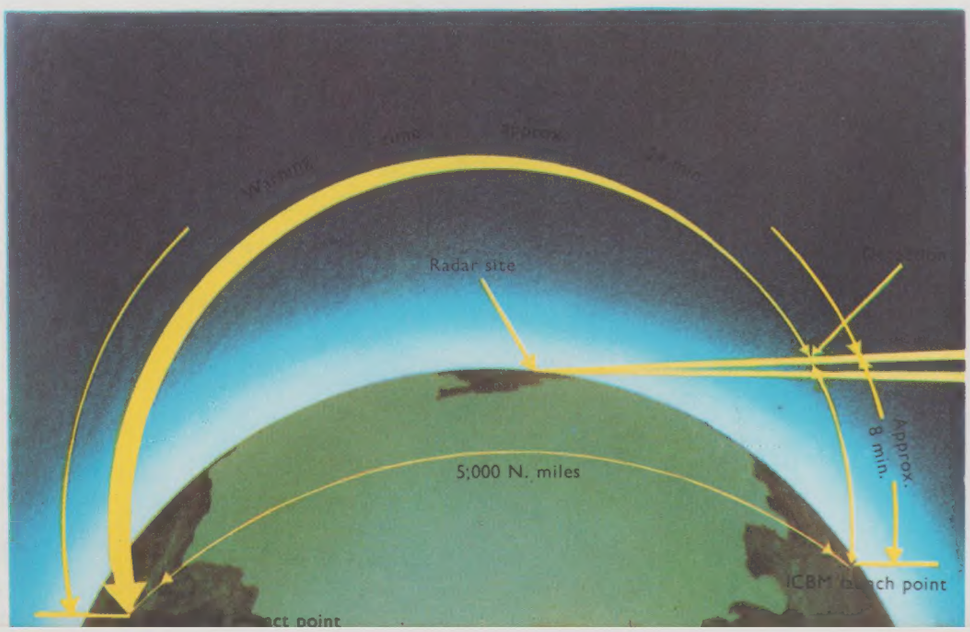
The idea of having deterrent forces equipped with nuclear bombs to try to discourage an enemy from making war has been used by the United States since 1945, when the first atomic bombs were dropped on Japan.

The Russians exploded their first A-bomb in 1949, the British in 1954, and the French in 1961. The next is expected to be China, probably in 1964 or 1965. Once a country has A-bombs the much more powerful H-bomb is not difficult to make scientifically, but it costs many hundreds of millions of pounds.

In the mid-1950's Russia and America faced each other across the North Pole, which lies on the shortest route between the two countries, with heavy bomber forces. Today they threaten each other mainly with rockets. They – and Britain – still keep bomber forces but they recognise that by 1968 at the latest there will be little hope that a bomber flying in the atmosphere could avoid being shot down by anti-aircraft rockets.

Russian and American rockets

The Russians have made up for being behind with their first nuclear bombs by starting serious research on rockets soon after the Second World War, and at least five years ahead of the Americans. Oddly enough this was because the Americans mistakenly thought H-bombs would be too big to be carried far by rockets.



How the BMEWS at Thule could detect a hostile ICBM 24 minutes before it reached the USA

Previous page: Diagram of nuclear defence and attack forces. Defence: (1) part of ICBM early warning radar; (2) surface-to-air missile; (3) aircraft distant early warning radar. Attack: (4) ICBM; (5) long-range bomber; (6) low-flying medium bomber; (7) ICBM buried in protective silo; (8) Polaris missile being launched from submarine.

THE LOWER PRIMATES

A group of lemurs in their natural habitat

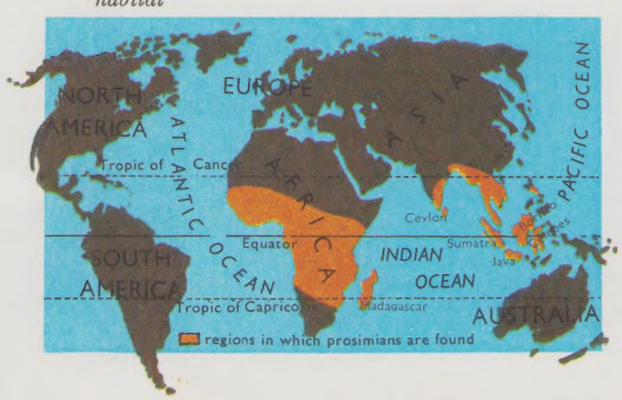
WE have already described the apes and monkeys of the Old World and the monkeys of the New World (see pages 2311 and 2375). These, with man, can be classed together as the 'higher primates'. There are, however, a number of other small primates whose brains, and certain other features, show them to be rather more primitive than the monkeys. For convenience these 'lower primates' are all classified together in a suborder of the primates called the Prosimii, but their exact relationship with the higher primates, and with each other, is uncertain.

The Prosimii are found only in the Old World, in Africa, southern Asia, and the islands near these regions – there are more prosimians in Madagascar than anywhere else. At a very remote period Madagascar was part of an enormous continent to which geologists have given the name *Gondwanaland*. During the last couple of hundred million years this ancient continent has become divided up. Some geologists say it broke up and drifted apart like icebergs; others believe some of it sank beneath the sea. Anyway, as a result Madagascar became isolated an immensely long time ago, and many primitive forms of animal life have survived there because they have not had to compete with the more advanced and efficient animals. The lemurs, which are found only in Madagascar, have developed there in great variety.

The different types of prosimians are distributed as follows: the potto and the galagos or bush-babies in Africa; the true lemurs and the aye-aye in Madagascar; the tree-shrews, the lorises, and the tarsier in southern Asia and Indonesia. The tarsier is a very strange animal, so different from all the other prosimians that it is often classified in a distinct suborder of its own.

The most primitive primates

By far the most primitive of the prosimians, and so of all the primates, are the tree-shrews (*Tupaia*) of India and south-east Asia. Until recently they were not recognised as primates at all, but were classified in the Order Insectivora as relatives of the shrews, moles, and hedgehog. They are little rat-sized animals, looking rather like squirrels, that live among the trees of the tropical forests. Tree-shrews are nearer in type and appearance to the early ancestors of all the primates than any other living animals.



The tree-shrew

Female black lemur

Aye-aye

Aye-aye (*Daubentonia madagascariensis*). The aye-aye is a most peculiar animal and quite distinct from all the other lemurs, though it is classified with them. It is about the size of a cat, and has a bushy tail and two large rodent-like incisor teeth in each jaw. Its fingers are long and the third or middle one is very slender; it is used for extracting insects from crevices and also for scooping out the pith of bamboo and sugar cane, which the animal first bites with its chisel-like front teeth. Aye-ayes live in dense forests and bamboo thickets in Madagascar and are rather rare animals.

Male black lemur

A pair of black lemurs (*Lemur macaco*). In this species the male and female are quite different in appearance, and it is really only the male that deserves the name 'black lemur'. Black lemurs are tree-living animals and inhabit the forests of the north-west coast of Madagascar.

Potto

Potto (*Perodicticus potto*). The potto lives in the tropical forests of West Africa. It is a nocturnal animal that climbs slowly about among the trees, holding on very tightly with its fingers and toes. A strange feature of the potto is that the bones of its vertebrae project through the skin along the back of its neck, forming a row of spines. It is said to use these in defence, but there seems to be some doubt whether this is their real purpose.

Ring-tailed lemur

Ring-tailed lemur (*Lemur catta*). This strange-looking animal is quite unmistakable – and it is easy to see how it got its name. It is about 4 feet long, including its tail, and lives in Madagascar, inhabiting dry, rocky country. It can climb very well, but is quite at home on the ground, where it runs about with its tail held straight up in the air.

Head of Verreaux's sifaka

Verreaux's sifaka (*Propithecus verreauxi*). This species belongs to the group of lemurs called indris or silky lemurs, which are included in a distinct family, the Indridae. It has very long hind legs and moves on the ground by hopping, rather like a kangaroo. Like all the true lemurs it is found only in Madagascar.

Lesser mouse lemur

Lesser mouse lemur (*Microcebus murinus*). This little lemur is the smallest of all the primates; its body is only 4 or 5 inches long. It lives in damp forests in Madagascar and makes a neat, round nest in a tree, very like a bird's nest. During the dry season mouse lemurs go to sleep just as dormice do in winter, getting nourishment from a store of fat in their tails.

Slender loris (*Loris tardigradus*). Lorises, the Asiatic equivalents of the African potto, are small, slow-moving, nocturnal animals that climb about in trees in the tropical forests. The slender loris measures 8 to 10 inches and has long legs and very large eyes, and it lives in southern India and Ceylon. It eats mainly insects, with an occasional small bird. Another species, the slow loris, lives in south-east Asia and Indonesia. It is larger than the slender loris and has shorter legs; its habits are similar but its main food is fruit.

Slender loris

Indri

Indri (*Indris brevicaudata*). The indri is the largest of all the lemurs; it is about 3 feet long from its nose to the tip of its stumpy tail. It is included, with the sifaka, in the family Indridae. Indris are active by day and are sociable, moving about in small troops or bands.

Tarsier

Tarsier (*Tarsius tarsius*). The tarsier is one of the strangest mammals in the world. It is the size of a rat and lives entirely among trees. Its eyes are enormous and its feet have sucker-like pads on them. It is a nocturnal animal and feeds on insects. When it is in pursuit of its prey it can make huge, frog-like leaps of up to 16 feet from one branch to another. These extraordinary animals are found only in the dense forests of Borneo, Sumatra, and the Philippine Islands.

Note: these animals are not all drawn to the same scale

LOCAL GOVERNMENT

Local authorities are responsible for building and maintaining roads; here a giant snow blower is clearing the road for traffic

IF your house is burgled you call the police. If your school catches fire the fire brigade is called. In order to read a certain book you may visit a public library. In all these cases and in many others you are making use of services provided not by the central government in Westminster but by the local authority. In the financial year which ran from April 1959 to the end of March 1960 local authorities spent over £2,437,190,000 on the services they provide. These services are not provided completely uniformly throughout the country, for different areas do not need exactly the same things. Local people are best able to assess local needs – hence local authorities. Although this article refers only to England and Wales, the system is similar in other parts of the U.K.

The different types of local authority

Every county in England and Wales has an elected County Council. This provides most of the major services like fire brigades, schools, police, and libraries in the particular county. It does not deal with housing, nor with certain very specialised local requirements – these are in the hands of the Urban District Council, the Rural District Council, or the Borough Council. You are therefore governed at a local level by two authorities: the County Council, and the UDC, RDC, or Borough Council, depending, of course, on what kind of place you live in. However, if you live in certain large towns like Liverpool, Manchester, or Birmingham, you come under only one authority – the County Borough. These are 'all-purpose' authorities. London has a rather special arrangement – it is governed by the London County Council, 28 Metropolitan Boroughs, and the City of London.

There are 83 County Boroughs and most of these are big towns; the oldest ones were set up by the Local Government Act of 1888. There are 61 County Councils; these were set up by the same Act as the County Boroughs and for the most part they correspond to the geographical counties. There are 317 Borough Councils, 564 Urban District Councils, 471 Rural District Councils (all set up in the late 19th century), and about 7,500 Parish Councils which are now very minor authorities. Each council is governed by a body of councillors who are elected by the residents of the area and the work is carried out by officers employed by the council.

Local authorities have power only within a framework provided by central government. Parliament makes certain ministries responsible for the efficient running of local authorities. The Ministry of Housing and Local Government has the most responsibility for local authorities, but the Ministries of Health, Transport, and Education, and the Home Office are also concerned. Central government controls local authorities by several means: by inspection of works, by detailed instructions, and most important of all, by controlling the purse-strings.

Local government can only borrow money (for example from banks) if central government lets it. The importance of this can be seen when we consider that for January to June 1963 a total of £498,000,000 was borrowed by local authorities. Borrowed money is invested in assets that last a long time, like houses and schools. Money is also needed to provide services and central government gives local authorities about one-third of all they need for this, through Exchequer grants. This amounted to £705,590,000 in 1959 to 1960, the total income of local authorities being £1,949,041,000.

What services do they provide?

Local authorities provide many services, and we can divide these into three groups: those for the *protection*, those for the *convenience*, and those for the *welfare* of local residents.

The services of protection are the police, fire brigades, and Civil Defence. There are 125 police forces in England and Wales and about 80,000 policemen. The Home Office at Whitehall makes quite sure that each local force is doing its job properly and there are Home Office inspectors in many parts of the country. There are 135 fire brigades, all provided by County Councils or County Boroughs. Central government issues their regulations and inspects the brigades at intervals. These brigades man 1,600 fire stations and there are 21,000 whole-time and 14,200 part-time firemen. Each year they

rescue about 500 people and answer about 250,000 calls. Civil Defence Corps are usually recruited and organised by County Councils and County Boroughs. The volunteers are trained in rescue work, first aid, and welfare work. At the end of March 1962 there were over 320,000 members of the Civil Defence Corps.

Roads and bridges are the most important services of convenience. All local authorities have some highway duties and together they are responsible for over 157,000 miles of road. Existing roads must be made safe, and new roads – except for trunk roads and motorways which are the sole concern of central government – must be built.

Certain local authorities are also responsible for harbours, docks, and piers. Other services can be provided if the authority chooses to do so; these may include public transport, public baths, public conveniences, theatres, orchestras, museums, and restaurants. Public libraries are provided as part of the education service. At the present time there are about 548 public library authorities, providing about 40,000 libraries in which there are about 75,000,000 books. Over one-quarter of the total population are members of these libraries.

Some local authorities provide land which can be hired for allotments or small-holdings. It is in these kind of services that there needs to be local variation.

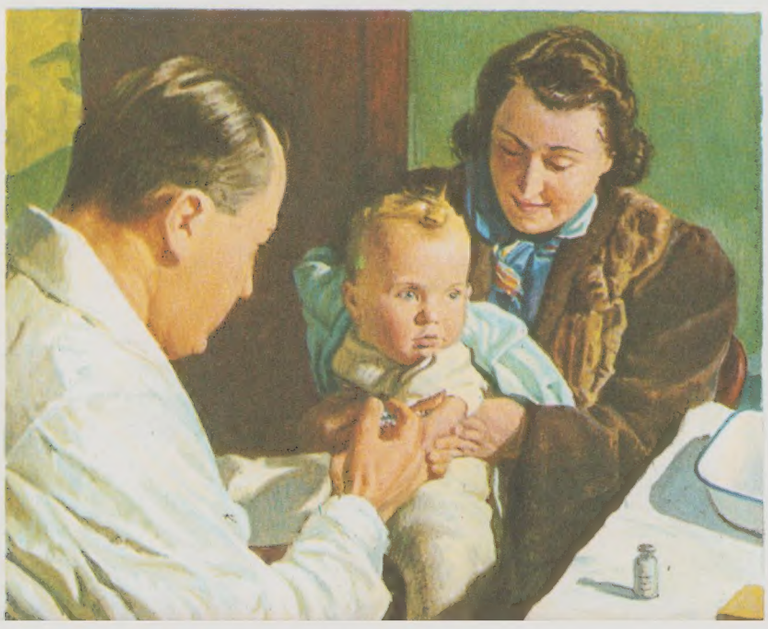
Welfare services

Now let us look at personal services rendered to various age-groups. The maternity and child welfare services provide welfare clinics, where mothers and babies can have regular supervision by doctors and nurses and where children can be vaccinated against smallpox and immunised against diphtheria and poliomyelitis. At the birth of her baby a mother may be visited by a local authority midwife and later by the health visitor. Many local authorities provide day nurseries where mothers can safely leave their children when they go out to work.

From the ages of 5 to 15 years we must all be in full-time attendance at school. About 45 per cent of local authorities' money is spent on this service alone. Over 7,000,000 children attend local authority schools, compared with about 500,000 at schools wholly or partly independent of the local authorities.

There has been a tremendous number of schools built since the war, and in 1959 the government announced that local authorities would spend a further £300,000,000 on educational buildings between 1960 and 1965. Local education authorities also provide special schools for handicapped children. In addition to education, school children are all given free medical and dental treatment and free milk, and many are given subsidised school meals and helped with travelling expenses to school. Many university and college students also get grants to help support them from their local education authority.

This baby is having one of the routine check-ups provided by local authority clinics



Local authorities have to keep their districts clean; here a dust-cart helps in this important task

Central, not local, authority provides for people after they have finished their education. However, local authorities must provide services for old and infirm people, also the blind and mentally ill. Many old people living in their own homes are visited by domestic helps and home nurses, and are provided with hot meals – usually services of the local authority. Many old people who cannot live at home live in local authority homes.

Services for the destitute were once the main concern of local authorities. This task has now been taken over by central government except for two services. Local authorities must provide accommodation for homeless families; they must also look after children whose parents are not able to do so. Today over 63,000 children are in the care of local authorities.

Housing

Local authorities plan both for the beauty and cleanliness of their districts. Slum clearance in particular is a major part of their programme. In 1955 there were about 850,000 slum houses; by 1961 nearly 300,000 had been demolished. Local authorities are very important landlords and they have built and own about 4,000,000 of the 15,000,000 houses in England and Wales today; they have also built over 50 per cent of the houses put up since the Second World War.

HOW SPARTA WAS GOVERNED

THE story is told that Lycurgus, when asked by a citizen whether he would set up a democratic government in Sparta, replied: 'My friend, who rules in your home, yourself or your children?' Lycurgus, about whose life we know very little, probably lived at the end of the 9th century B C, and was said to be the author of the reforms which established Sparta's unique constitution. It was a form of government based on rigid discipline and military training and very different from the democratic constitution of Athens (see page 2394).

A king of Sparta; detail of a statue in the Loggia dei Lanzi at Florence

THE ORIGINS OF SPARTA

During the 12th century B C Greece, in which there were already several different races living, was invaded by tribes of the Dorian race who came down from the north, driving out or enslaving the inhabitants. A group of these tribes settled in Sparta, a wide, fertile valley in the south of the Peloponnesus (see map). After quarrelling among themselves for a time they finally united under the leadership of two kings who ruled jointly. This kind of government is called *dyarchy*, from two Greek words, *dyo*, two, and *archè*, government. The Spartans then conquered Laconia and, later, Messenia. Because of their successes in battle these conquerors, themselves few in number, had to keep in subjection a much larger group of people. As a result they lived virtually in a state of siege.

A Spartan warrior

Map showing Sparta's position in Ancient Greece

THREE SOCIAL CLASSES

Every state in Ancient Greece had slaves but these were usually foreigners captured by their masters in war.

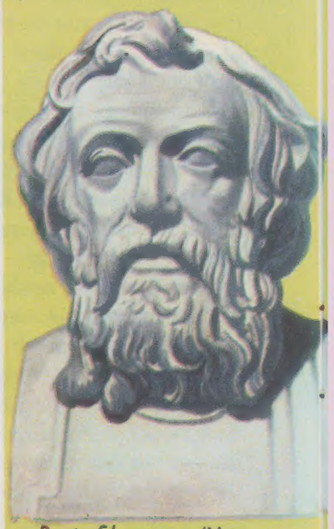
But in Sparta the citizens were served by two subordinate classes, both native inhabitants of the land, one having a few rights, the other none. The social system therefore was based on three distinct classes.

The Spartiates were the Dorian conquerors. They were the only people who enjoyed the rights of citizenship in Sparta and only they could take part in the government. Although all three classes were required to serve in the army, only the Spartiates spent their whole lives training for war. All Spartiates were treated as equals.

The Perioeci (their name means in Greek 'those who live round about') were people who lived in towns in the vicinity of Sparta. They were not citizens and they had no say in the government of Sparta. They were, however, allowed to govern their own communities, to cultivate their own lands, and to carry on manufacturing and trade. In return for these privileges the Perioeci had to pay heavy taxes and to send a quota of soldiers to the Spartan army.

The Helots were non-Dorians conquered by the invaders and reduced by them to the position of slaves. They were tied for life to one of the estates which they were forced to cultivate for the Spartiate who owned it. The Helots had to provide the Spartiates with a fixed amount of produce from the land and perform military service when required. They were carefully watched for signs of rebellion; at the first hint of insurrection offenders were mercilessly punished. They had no civic rights, but Helots who distinguished themselves in war were sometimes granted their freedom.

THE



Bust of Lycurgus (National Museum, Naples)

THE MILITARY

Because they ruled people who were always ready to revolt, the Spartiates were

CONSTITUTION OF LYCURGUS

In his reform of the constitution Lycurgus took away most of the power of the kings and gave it to elected officers so that all the citizens should have an equal chance to take part in the government. The power was now distributed among four institutions: the kings, the ephors, the *gerontes*, and the assembly.

At the head of the state were the two kings who inherited their positions. Under the constitution of Lycurgus their power was limited. They led the army in war and they acted as priests in religious ceremonies. There were five ephors who were elected annually by the assembly. Any Spartiate was eligible for election. They were the chief administrators of the government. The ephors were in charge of the *krypteia*, the secret police whose duty it was to spy out any insurrection among the Helots. They also had to see that the kings did not overstep the constitution. The council of the *gerontes* or elders contained 28 members and the two kings. The *gerontes* were elected by the assembly and had to be Spartiates over 60 years of age. They held office for life. This council was very important because proposals could be submitted to the assembly only through the *gerontes*. In addition the *gerontes* were the judges in criminal cases. The assembly was the meeting together of all Spartiates over the age of 30. The assembly voted on motions put before it by the *gerontes* but its direct influence was not very great.

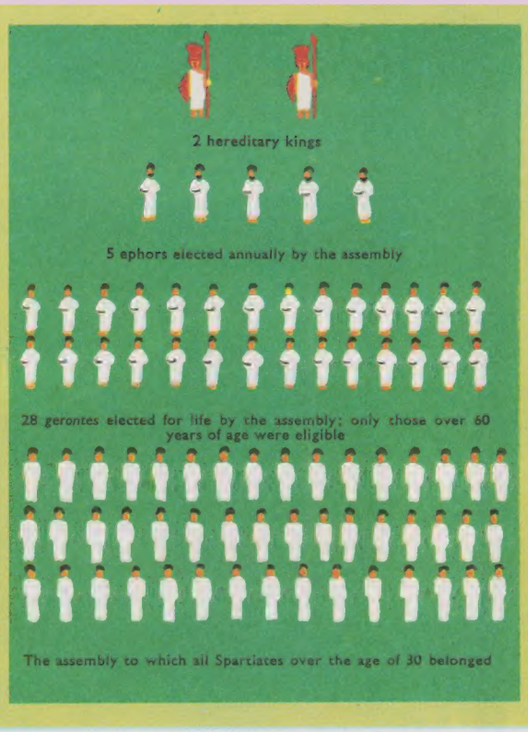

2 hereditary kings
5 ephors elected annually by the assembly
28 gerontes elected for life by the assembly; only those over 60 years of age were eligible
The assembly to which all Spartiates over the age of 30 belonged

Diagram illustrating the government of Sparta after the reforms which Lycurgus made in the 9th century B C

The strict discipline established by Lycurgus forbade the Spartiates to dine comfortably in their own homes. Each Spartiate would go to his appointed 'mess' where he would join a group of 15 or so comrades to eat the traditional 'black broth' made from pork cooked in blood and seasoned with salt and vinegar

LIFE OF THE SPARTIATES

constantly prepared for war. In the reforms which he made to strengthen the state after one such uprising by the Perioeci and the Helots, Lycurgus introduced even stricter military discipline than before. Every Spartiate youth of Sparta had to undergo a harsh and rigid military training from the age of seven. As soldiers they were famous throughout Greece and the story of Leonidas is only one example of their bravery. When in 480 B C the Persian King Xerxes was invading Greece with an immense army, Leonidas defended the pass of Thermopylae in northern Greece with only 300 Spartiates. Despite repeated attacks by the Persians Leonidas and his men held the pass until every one of them had been killed.

Bas-relief of a funeral for a young Spartan warrior (6th century B C; National Museum, Athens)

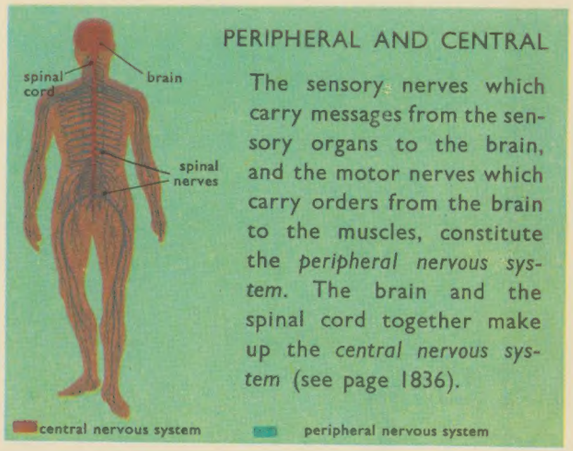
Under Sparta's strict military regime the arts did not flourish as they did in the more liberal atmosphere of Athens, the great rival of Sparta. Yet by their unique devotion to discipline the Spartans won the admiration not only of their contemporaries but of all ages. It was fitting that the tombstone set up at lonely Thermopylae to Leonidas and his 300 followers should have borne the inscription: 'Traveller, tell the Spartans that here we lie obedient to their commands.'

THE NERVOUS SYSTEM

WHEN a general commands an army in battle it is important for him to know as clearly as possible what his enemy is doing. It is for this reason that reconnaissance parties watch the enemy's movements and report to headquarters by field telephone. The general considers each report in the light of all the others that reach him and then decides what action must be taken. Out along more telephone lines go his orders, and the troops which receive these messages immediately carry out the general's commands.

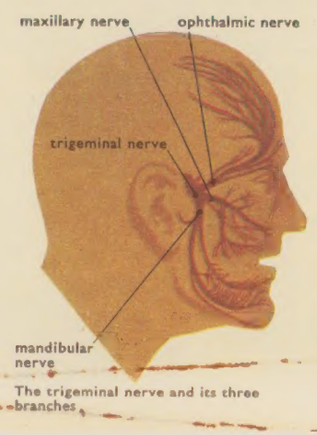
This kind of military communication illustrates excellently the working of the human nervous system. The reconnaissance parties are the sensory organs such as the nose, the eyes, the ears, and the organs of touch and of pain in the skin. They receive information from the outside world and relay it along *sensory nerves* to the brain. The brain is the general in his headquarters. Here all the sensory messages come together and all the decisions are made. The brain's orders are transmitted along *motor nerves*, quite different from the sensory nerves, and quickly reach the muscles in any region of the body. The muscles obey the commands and move the parts of the body to which they are connected.

One further part of the nervous system needs to be fitted into this scheme. It is the *spinal cord* lying inside the backbone. This bundle of thousands of nerve fibres is like a large telephone cable with many branches leading off at intervals along its length.



PERIPHERAL AND CENTRAL

The sensory nerves which carry messages from the sensory organs to the brain, and the motor nerves which carry orders from the brain to the muscles, constitute the *peripheral nervous system*. The brain and the spinal cord together make up the *central nervous system* (see page 1836).

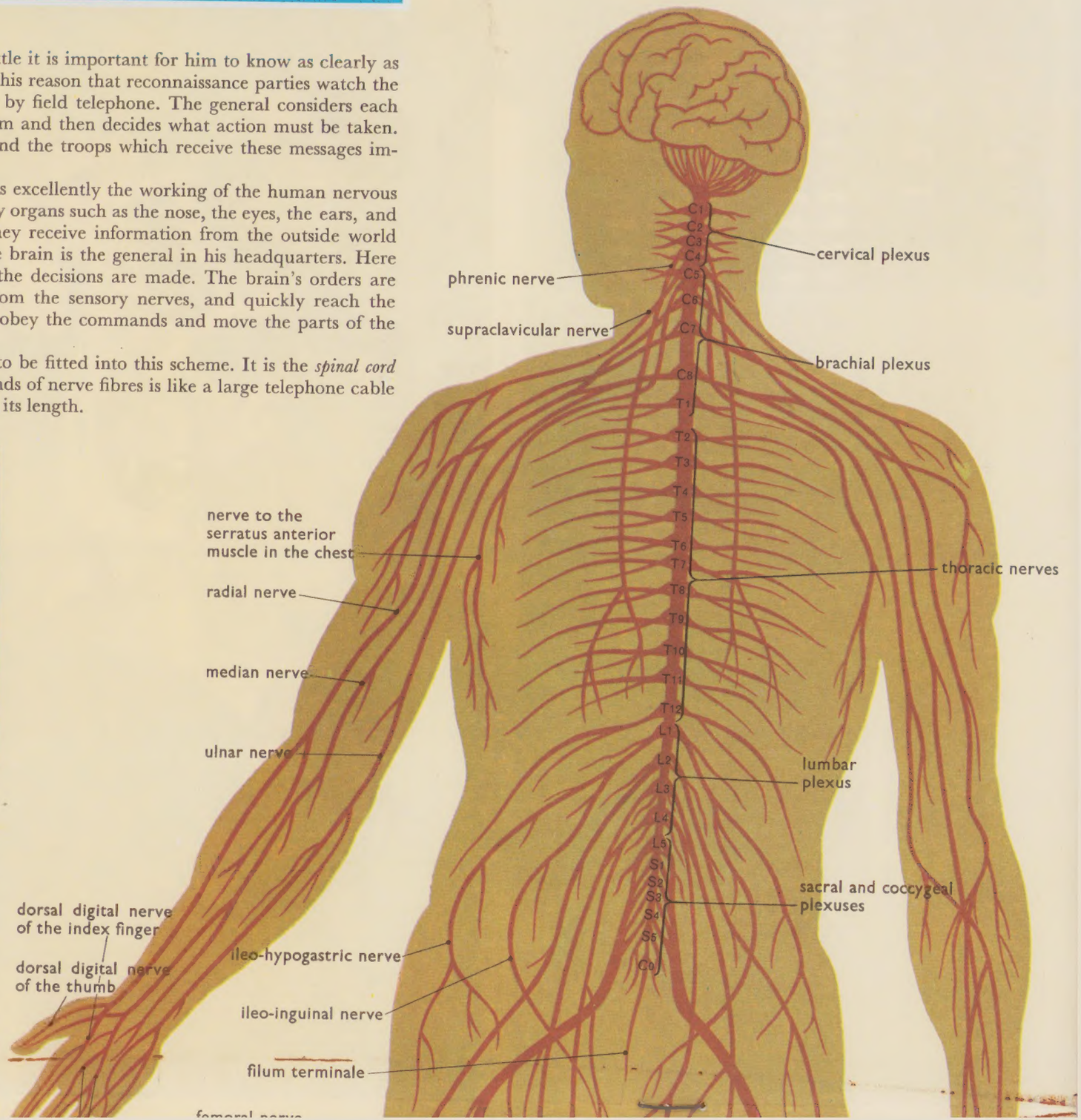


The trigeminal nerve and its three branches

The cranial nerves

In human beings 12 pairs of nerves arise directly from the substance of the brain. These *cranial nerves* chiefly supply the head and neck. Each cranial nerve leaves the skull through a small hole in the bone called a *foramen*, and then makes

A DIAGRAM TO SHOW THE DISTRIBUTION OF SOME IMPORTANT NERVES



men, and then makes its way through the tissues to the organs that it serves.

Some of the cranial nerves are solely sensory in function. Among these are the *olfactory nerves* which carry the sensations of smell from the nose, the *optic nerves* which carry the sense of sight from the eyes, and the *auditory nerves* which carry the sensation of hearing from the ears.

Three of the cranial nerves are almost entirely motor nerves. Their task is to transmit messages to the muscles which move the eyeballs. These nerves are called the *oculomotor*, the *trochlear*, and the *abducent* nerves. Many of the cranial nerves, however, are *mixed nerves*, which contain both sensory *and* motor fibres. The *trigeminal* nerve is a cranial nerve of this type. It carries messages of sensation to the brain from most of the face, and at the same time it carries in the opposite direction the orders which control the chewing muscles.

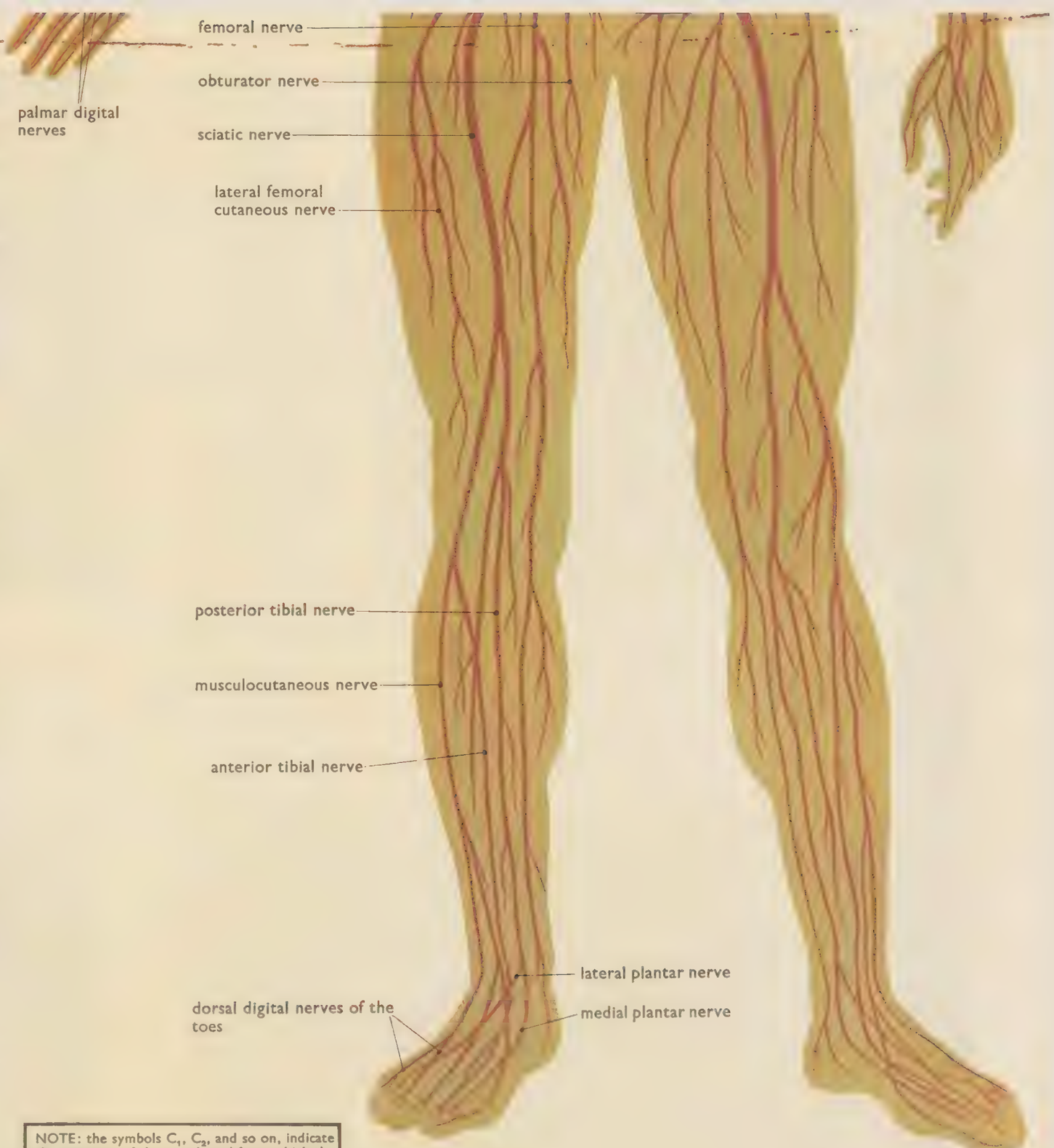
The spinal nerves

The spinal nerves arise from the spinal cord and they all have both sensory and motor functions. Altogether there are 31 pairs of spinal nerves: 8 pairs of cervical nerves in the neck, 12 pairs of thoracic nerves in the chest, 5 pairs of lumbar nerves, 5 pairs of sacral nerves, and 1 pair of coccygeal nerves.

Each spinal nerve arises from the side of the spinal cord by two *roots* which unite immediately to form the nerve. The nerve leaves the bony spinal canal in which the cord lies through a small foramen between two adjacent vertebrae.

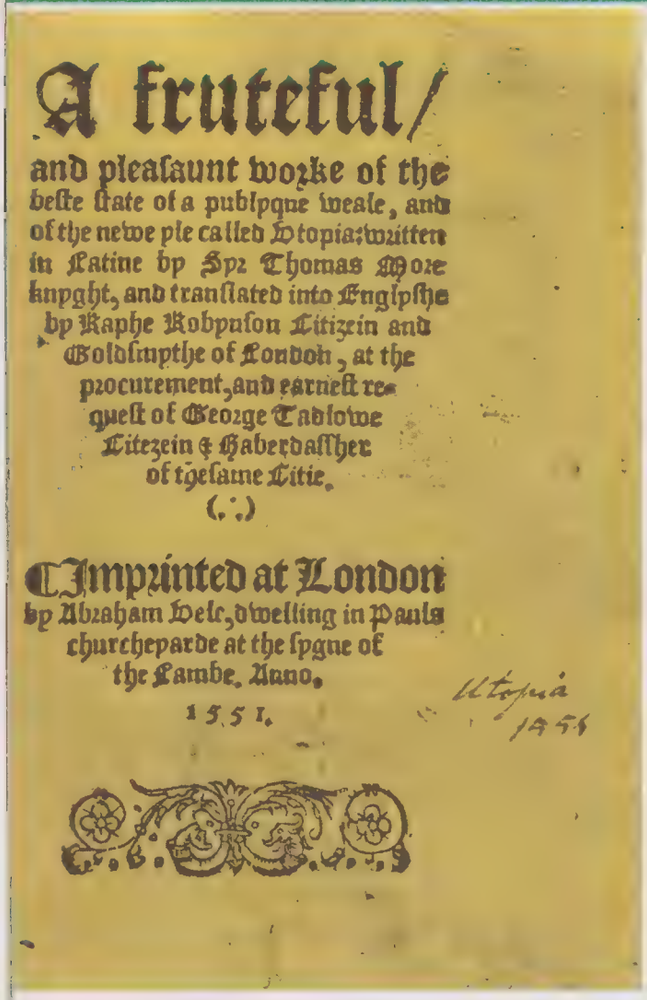
The sensory fibres of the spinal nerves convey messages of touch and pain from the skin to the spinal cord. In the cord these messages are then relayed to the brain. The motor fibres of the spinal nerves pick up orders transmitted from the brain down the cord, and convey these orders to the muscles.

In the chest the arrangement of the spinal nerves is quite simple. Each nerve runs forwards in the tissues and supplies a girdle-shaped area around the chest. But in the neck and in the lumbar and sacral regions the arrangement is more complicated. Here groups of spinal nerves join together to form *plexuses* from which large nerves arise to supply the extensive areas of skin and the many muscles of the upper and the lower limbs.



NOTE: the symbols C_1, C_2, and so on, indicate the segments of the spinal cord from which the various nerves originate.

ENGLISH POLITICAL THOUGHT



A fruteful/
and pleasaunt worke of the
beste state of a publyque weale, and
of the newe ile called Utopia: written
in Latine by Syr Thomas More
knyght, and translated into Englyshe
by Raphe Robynson Citizein and
Goldsmythe of London, at the
procurement, and earnest re-
quest of George Tadlowe
Citezein & Haberdasther
of the same Citie.
(.·.)
Imprinted at London
by Abraham Vele, dwelling in Paules
churcheyarde at the sygne of
the Lambe. Anno.
1551.
Utopia
1551

The title page of Thomas More's Utopia *(published* 1551)

OCCASIONALLY somebody says something which lives for ever. One of these immortal remarks was made by the Greek philosopher Aristotle (see page 1222) when he said: 'Man is a political animal.'

What he meant was that man could not live properly by himself but found it necessary to bind together in societies and live under laws imposed by a government. It is obviously important to have a just government and wise laws; the philosophy of government, with a view to making it as good as possible, is known as political theory.

Until the 16th century there was not much political thought in England, or indeed, after the Greeks and Romans, anywhere. This was for two reasons. First Plato and Aristotle were regarded with such reverence that there seemed little point in trying to add to what they had said. Secondly the advent of Christianity made man much more concerned about his relationship with God than with his government. There were, of course, great mediaeval political philosophers such as Augustine and Thomas Aquinas, and, in England, William of Occam and John of Salisbury. But to all of them truth had already been revealed by God. What they felt was needed was to bring human laws into line with Divine Law as known through Revelation, not to think of anything new.

Beginnings in England

But in the 16th century something new happened. The Reformation resulted in the partial eclipse of the two great mediaeval institutions – the Papacy and the Holy Roman Empire. This meant that the state became far more important. The basic problem for the law makers had been to adjust man's relationship with God; now they had to consider man's relationship with the state.

It is for this reason that Henry VIII was one of the most important (though certainly not the most profound) political theorists England has ever had. He said that he was the Supreme Head of the Church and that Anne Boleyn was his lawful wife. The Pope denied this and was promptly excluded, together with his Church, from an important say in English affairs.

Apart from a brief Catholic revival under Queen Mary, Henry's decision on the most serious of all 16th-century problems – the relations between Church and state – was never reversed. However, the problem did produce two important political theorists, Sir Thomas More and William Tyndale, who ranged themselves on opposite sides. More believed that ultimately the state should be subordinate to the Church, and the Church in England subordinate to Rome. Tyndale, on the other hand, considered that the king should be absolutely supreme in the state and that the Church should

John Locke (1632–1704) *was an early advocate of democratic ideas. He thought government rested on the consent of the governed*

David Hume (1711–1776) *was one of the greatest of all philosophers. He applied psychology to political theory*

Edmund Burke (1729–1797) – *conservative*

be based not on the authority of Rome but on the Scriptures.

The Reformation meant that the state had triumphed over the Church, but it had not triumphed over God. Nobody in the 16th century believed that the king or the queen could do as he or she liked. Those who believed that the laws of the state conflicted with the laws of God criticised the former accordingly.

But you will notice that an extremely significant thing had now happened. People were no longer agreed on what the laws of God were. One could hardly expect Catholics and Puritans, who were both persecuted by Elizabeth, to accept her religious decisions as the accurate interpretation of the word of God. Michael Hooker supported Elizabeth on the grounds that man's 'contract' to obey the government gave him a moral duty to obey the authority of the state.

And because the government now claimed to interpret the laws of God it had sown the seeds of its own downfall – for the non-Anglicans began to plot its overthrow. The Catholics tried to blow up the Houses of Parliament in 1605 and the Puritans raised such opposition to the monarchy that it was forced to stand and fight; the result was the Civil War. The monarchy lost, and in 1649 Charles I was executed.

In the course of these conflicts men had been forced to rethink the whole business of government. The Puritans in particular sought to limit the power of the Crown, making it dependent on the consent of the Commons (where they had influence) in Parliament. Their constitutional successes won in the 1640's were partly destroyed by the dictatorship of Cromwell, the restoration of Charles II, and in particular the rather stupid despotism of James II. But the gains made at the expense of the Crown were too great to be swept away; after the 'Glorious Revolution' of 1688 Parliament placed so many restrictions on William and Mary that England from then on can be called a 'constitutional monarchy'.

Freedom not to die and freedom to live

The turbulence of the 17th century produced two of the greatest of all political theorists, Thomas Hobbes (see page 1392) and John Locke.

In his *Leviathan* (1651) Hobbes makes a plea for a strong, stable government; this is hardly surprising in view of the terrifying times in which he lived. In any case he was a timorous character. Some thought this was due to his premature birth in 1588 when, it is said, his mother was startled by the news of the Spanish Armada. However that may be, Hobbes went to extreme lengths to justify any government provided it could produce peace and security.

His great contribution was that he saw government existing for the purpose of the individual and not the individual as existing for the sake of either the government or, indeed, for the sake of God. He thought that originally men had lived in a State of Nature without government. But because men are naturally greedy and selfish this State of Nature was chaotic. So men chose a government to rule them. Hobbes felt that in order to make the government effective *all* power must be given to it. Thus, according to Hobbes, a government was good if it kept order. Apart from this Hobbes made no demands on it to rule either justly or wisely.

John Locke was totally different. He too believed in a State of Nature and that government was a *social contract* arranged by the early men for their joint benefit. But Locke believed that men were naturally good, not bad, and that the State of Nature was happy. This was because even in the State of Nature man was governed by the Law of Nature known through reason, which was the will of God. According to Hobbes, reason was capable only of teaching a man the probable consequences of his actions. But Locke's reason taught him whether those actions were morally good or bad. Thus 'the State of Nature has a Law of Nature to govern it, which obliges everyone, and reason, which is that law, teaches all mankind who will but consult it, that being all equal and independent no one ought to harm another in his life, health, liberty, and possessions'.

Locke agreed that government brought many advantages but he also believed that these *natural rights* of life, liberty, and possessions were carried over from a State of Nature into civil society under a government. These natural rights could not be given up – because they came from God. 'A man . . . hav-

Robert Owen (1771–1858) *was one of the first socialists. He founded an unsuccessful 'communist' colony in North America*

Jeremy Bentham (1748–1832) – *radical*

ing, in the State of Nature, no arbitrary power over . . . another, but only so much as the Law of Nature gave him for the preservation of himself and the rest of mankind, this is all he doth, or can, give up.' So, according to Locke, the government needed to interfere little and if it interfered too much (as did James II) the government could actually be deposed. His famous *Second Treatise* of government published in 1690 used these arguments in a way that has led many to think he was justifying the 'Glorious Revolution' of 1688. Locke's doctrine of natural rights was widely accepted, and still is today. It greatly influenced the American democrats in forming their famous Declaration of Rights.

The great Scotsman David Hume challenged the idea of natural rights. According to him, men were governed by beliefs and opinions rather than reason. What was generally considered best was likely to be best. Men were generally agreed that they should obey the government because otherwise human society would collapse.

'Nice equipoise'

This theory was developed by Edmund Burke who believed that constitutions developed in a complex and often inexplicable way. They evolved precisely because, at each stage, the general opinion was that this was the best constitution. No sudden inspiration on the part of anyone that they had discovered a set of 'natural rights' would justify them in tampering radically with that constitution. 'Our constitution stands on a nice equipoise with steep precipices and deep waters upon all sides of it. In removing it from a dangerous leaning towards one side there may be a risk of over-setting it on the other.'

Burke's philosophy became the basis of the conservative creed in England. One has to conserve what one has, and it is wrong to change it unless it is absolutely certain that the change is both beneficial, and probably inevitable in any case; any changes should be as gradual as possible.

The Utilitarians

This philosophy was rejected by the Utilitarians at the beginning of the 19th century. They were radicals as opposed to conservatives. Their leader was Jeremy Bentham. Unlike Burke he thought a lot was wrong with the British Constitution. He wanted universal suffrage, annual parliaments, and voting by ballot. He wanted to do away with the House of Lords and with the monarchy. He justified his opinions in the 'principles of utility' – that the government existed for no other reason than to please those it governed. He claimed that what the people desired above everything else was happiness. Therefore it was the government's duty to provide happiness, and his maxim 'the greatest happiness for the greatest number' became a popular slogan in politics.

John Stuart Mill carried utilitarianism a stage further. By the mid-19th century the government had accepted in principle its responsibility to provide happiness, and in doing so passed more and more laws which interfered with people's private lives. Mill considered that individual liberty was in danger and that in fact happiness varied from person to person. In his *Essay on Liberty* he states 'the sole end for which mankind are warranted, individually or collectively, in interfering with the liberty of action of any of their number, is self-protection'; and 'if all mankind minus one were of one opinion, mankind would be no more justified in silencing that one person, than he, if he had the power, would be justified in silencing mankind'. Mill therefore thought the government was most 'useful' when it was 'leaving well alone'. He is considered to be one of the fathers of liberalism. Liberalism was more or less completed by T. H. Green who saw the absurdity of letting everyone do just as they pleased; he sought to show from his idea of positive freedom that the individual could be free even under laws. For he believed that one's 'better self' was only realised in identifying oneself with (that is, obeying) the necessary laws of society.

The other important strand in English political thought is socialism. All British socialists owe a great debt to Robert Owen who, at the beginning of the 19th century, advocated the cause of the lower classes, the abolition of class distinctions, and the theory that labour (as opposed to capital and investment) is the source of wealth. He greatly influenced the formation of the Trades Unions and co-operative movements. Modern socialists accept the general principles of liberty as derived from Mill and Green but they combine these with more than a touch of Owen's 'communism', together with Bentham's idea that the state has a duty to provide what the people want.

John Stuart Mill (1806–1873) – *liberal*

Thomas H. Green (1836–1882) – *believed in state obligations*

SIR ROBERT WALPOLE

Sir Robert Walpole (1676–1745)

POLITICAL life in England for much of the 18th century makes sordid reading. Power depended not on principles but on influence. Many very important men held their offices because they made friends with the right people – the King, his lady friends, or leading politicians – even though they themselves were utterly incompetent. Robert Walpole is extraordinary not because he was morally a better man than his contemporaries (which he was not), but because he was outstandingly able; and because, while generally acknowledged as Britain's first prime minister, he held that position continuously for 21 years – a record unlikely to be broken.

Walpole was born in 1676, the son of a Norfolk squire, and he entered Parliament in 1700. He soon made his mark as a hard worker – skilful in debate and astute in his judgements. He became war secretary in 1708 and treasurer of the Navy two years later. But, as a Whig, he was about to suffer in an era of Tory vindictiveness. The Tories were supported by Queen Anne; her successor would be George, the Elector of Hanover, who knew that the Tories opposed him in favour of the 'legitimate' Stuart line. George would therefore choose his ministers from among the Whigs. So the Tories turned on the Whigs. Walpole was sent to the Tower on false charges of corruption and was expelled from the House of Commons.

As expected, George I preferred a Whig government, and in 1715 Walpole found himself first lord of the treasury and chancellor of the exchequer. The Tories were, for the time being, finished. But faction developed among the Whigs. For the moment the dominant force in politics was the King's favourite, Stanhope, whose war-like policies were opposed by Walpole and his brother-in-law Charles Townshend. They both resigned in 1717. Throughout his career Walpole's 'trade-marks' were to be economy at home and peace abroad.

Bubble bursts

Walpole had a strong following in the Commons and in 1719 Stanhope took him back into his government. In 1721 he once more became chancellor of the exchequer and first lord of the treasury. There was a reason for Walpole's elevation; in 1720 the South Sea Bubble had burst (see page 864) which made Walpole, but ruined his Whig enemies. Many of Stanhope's ministers were involved in the scandal; some committed suicide. Stanhope himself died of apoplexy in 1721 and his influential supporter Sunderland died in 1722.

Walpole's handling of the Bubble crisis made his reputation as a financial genius; his place in history is largely that of a great finance minister of the stature of Pitt, Peel, and Gladstone. He succeeded in restoring the country's finances after the incredible expense of the Spanish War of Succession. In 1717 he had established a 'sinking fund' which involved setting aside certain taxes each year to pay off the National Debt, while he enormously improved trade by abolishing most export duties; the abolition of duty on imported raw materials also helped manufacturers. To discourage smugglers Walpole tightened up controls and in 1723 instituted a 'bonded warehouse' system. This was unpopular but successful; it entailed storing in warehouses tea, coffee, and chocolate which were only liable to Excise duty when removed for domestic consumption.

Walpole's financial policy brought great prosperity to the country and an increased income to the government. But in 1733 his proposal to extend the bonded warehouse system to wine and tobacco caused an outcry. He gave way and withdrew his proposal. But to make up the revenue he needed he began more and more to raid his own sinking fund, for he was opposed to the increase on the land tax advocated by many.

After 1733 Walpole's authority slowly declined. His raiding of the sinking fund undermined the public confidence, and in particular his peace policy became increasingly unpopular, not only with the Tories but also with the 'patriot' Whigs like Pitt and the Duke of Newcastle. In 1739, much against his will, Walpole was forced into war with Spain; largely due to his own inefficient preparations disaster followed disaster.

In 1740 England was dragged into the War of the Austrian Succession and in 1741 Walpole's majority in the Commons fell alarmingly. He realised his time was up and resigned the following year. He was created Earl of Orford and died in 1745.

The years 1721 to 1742 are very much the Age of Walpole. There was no one of his stature to challenge him, and with a foreign king who did not speak English it was natural that he should dominate. His policies prevailed in all departments, and just as he created the cabinet system by consulting with a corporate body of ministers, so he became a prime minister by subordinating that cabinet to himself.

The great manipulator

Walpole built his support in the House of Commons, and looked to it for approval of his policies. But this was no 'democratic' support like that enjoyed by the younger Pitt and, even more, by Peel after 1832. For Walpole (who once said: 'every man has his price') relied on the current methods of bribery and jobbery. He used his influence with the King to get rid of his enemies. Able men who came to oppose him, like Carteret, Townshend, or Pulteney, were broken or ignored. Through the enormously wealthy Duke of Newcastle (whom he made secretary of state) Walpole controlled not only government but also Church appointments. Here his appointment of Whig bishops did something to reduce the Tory stranglehold on the Anglican Church.

Walpole was perhaps not a great man. Yet he was a very important one. He dominated by his superb manipulation of the machinery of his age, and his place in history is infinitely more significant than that of many men of greater inspiration who lacked his realistic common-sense and appreciation of what was wanted.

THE NETHERLANDS

FOR centuries the Netherlands (Holland) has been a nation at war; at war with the sea. Because the energies of the sea are inexhaustible, this battle can perhaps never be finally won. Until the 16th century severe floods were common, and though they have become less frequent as methods of dyking and damming have improved, they still occur occasionally – in 1953 the worst floods for a century caused £100,000,000 worth of damage. Spurred on by this disaster, the Dutch started a new project, called the 'Delta Plan', which should be completed by 1980. The channels separating the islands of Zeeland are being dammed at their seaward end and converted into fresh-water lakes, so that the whole area will be protected.

But in some ways the sea has been an ally, for the Netherlands' position on the North Sea led to the development of fishing and commerce. These were safeguarded by a powerful navy, which played an important part in maintaining the Netherlands' independence. Moreover, the sea proved invaluable in her greatest struggle of all – the fight for independence from Spain (see page 1352). In 1572 the 'Sea Beggars' of the Province of Holland seized Brille and Flushing and held them against the Spaniards. This began a general rising which led to the separation of seven United Provinces (the Netherlands) from both Spain and what is now Belgium (which remained Spanish). In 1574 the rebels used the sea once more by destroying the dykes and flooding the countryside against the Spanish during the heroic 'Siege of Leiden'.

The position of the Netherlands in Europe

② The ice melted and the sea poured in over the coastal land

③ Then an off-shore bar of sand formed parallel to the coast

④ Behind this dune line lay a shallow fresh-water lagoon

⑤ Rivers deposited material in the lagoon to form marshy land

⑥ Later the sea broke through the dune line to form inlets

① About 200,000 years ago, during the Quaternary period, much of Holland was covered by ice

THE FORMATION OF THE COASTAL LANDS

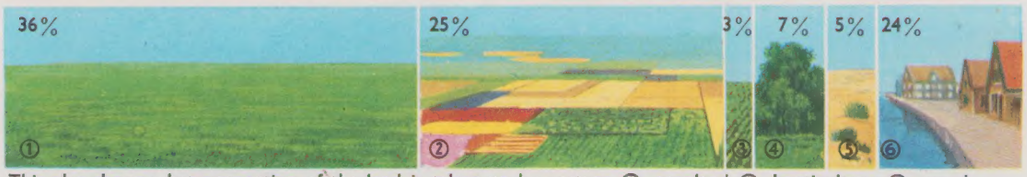
The flood danger to the Dutch coast results from the way in which the coastal lands were formed. In pictures ① to ⑥ (above) we see how sand dunes were formed by deposition from the rivers. The land behind them drained and the marshy lands so formed tended to dry out and to 'shrink', falling below sea-level. The sand dunes could not entirely resist the sea and so had to be strengthened by dykes.

FACTS AND FIGURES

Area: 13,315 sq. m.
Population: about 12 million
Capital city: Amsterdam (865,707)
Seat of government: The Hague (605,214)
Principal port: Rotterdam (730,224)
Railways: 2,019 miles
Navigable rivers: 4,232 miles
Monetary unit: gulden (guilder or florin)
Religion: entire liberty of conscience

THE STRUCTURE OF HOLLAND

HOW THE LAND OF THE NETHERLANDS IS USED



This plan shows what proportion of the land is taken up by pasture ①, cropland ②, horticulture ③, woodland ④, heath and waste ⑤, and buildings, roads, and water ⑥

The Ijssel Meer Reclamation Area

Another region is still in the process of being formed, namely the polderlands of the Ijssel Meer Reclamation Area. This was once the great sea inlet of the Zuider Zee. In 1932, after 12 years of building, the mouth of this inlet was closed with a dam 18 miles long, 400 feet wide, and 24 feet high, to form a lake known as the Ijssel Meer. Within five years this lake lost its saltiness and became a valuable source of fresh water. By 1980, 860 square miles of land are to be reclaimed from this shallow lake, in five major polders. The Wieringer Polder was finished by 1940 but during the Second World War it was flooded by the Germans; afterwards the land had to be redrained and the farms and villages rebuilt. Work on the Noord-Oost Polder, which included the construction of 11 new villages, was completed in 1961, while a considerable area of the Oost-Flevoland Polder is already under crops.

Regions and agriculture

The Netherlands can be divided into three main regions: the north-east, the south, and the coast. The north-east is formed of sandy soils which are not naturally fertile, supporting only heath and plantations of conifers in some parts. But most of the region is under mixed farming and the crops are used to feed the many dairy cattle.

The southern region contains three parts. In the lower Rhine and Maas valleys are rich pastures and orchards. Along the Belgian frontier are areas of poor heathland on sandy terraced soils. The land rises to just over 1,000 feet in south Limburg, a prosperous agricultural and industrial district.

The coastal district, although it lies below sea-level, is one of the most densely populated areas in the world. The land is divided into *polders* – units of reclamation – each of which is surrounded by a ring dyke and a canal. About $2\frac{1}{2}$ million acres of the polderland have to be pumped dry; this was once done by windmills, but now these have mostly been replaced by diesel or electric engines. The rich grass provides ideal grazing for thousands of cows, and dairy products, especially the famous Dutch cheeses, make valuable exports. Thousands of acres of vegetables and flowers are grown between Haarlem and The Hague, the most important being tomatoes and tulips.

Off the north coast are the Frisian islands; these were formed when the sea broke through the dunes and are connected to the mainland by mud flats, which are exposed at low tide.

A typical country view in the Netherlands showing a tulip field, a drainage channel, windmills, and pedigree cattle grazing on reclaimed polderland

EXPORTS
Vegetables, cheese, meat, petroleum, electrical products, and chemicals
Amsterdam
IMPORTS
Raw materials, crude oil, grain, iron and steel, machinery, and beverages

INDUSTRY

Although she possesses few raw materials, the Netherlands is highly industrialised. This is partly because of the skill of her workers, the lack of strikes, and the low prices, but chiefly because of a favourable geographical position, which allows the cheap import of goods by sea and river.

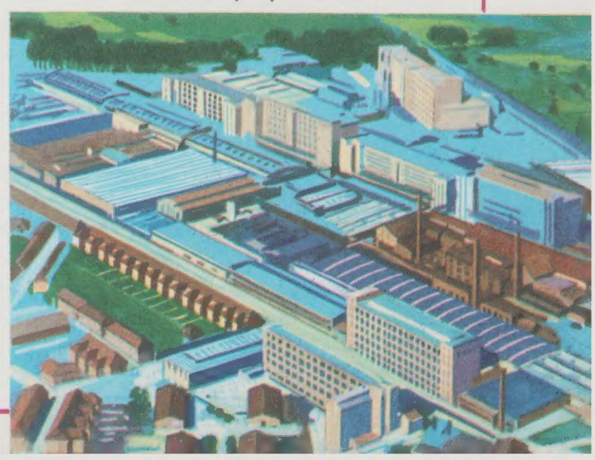
The chief industrial area is around Rotterdam; the products include ships, steel, petroleum, chemicals, paper, and vegetable oil. Rotterdam handles a greater tonnage than any other European port, including London, and new dock facilities are still being built. The second most important industrial area is south Limburg, where the Netherlands' only deposits of coal are situated. Although the coal is difficult and expensive to work, over 12,000,000 tons are produced annually. All the collieries are large – the Mauris mine is the biggest in Europe.

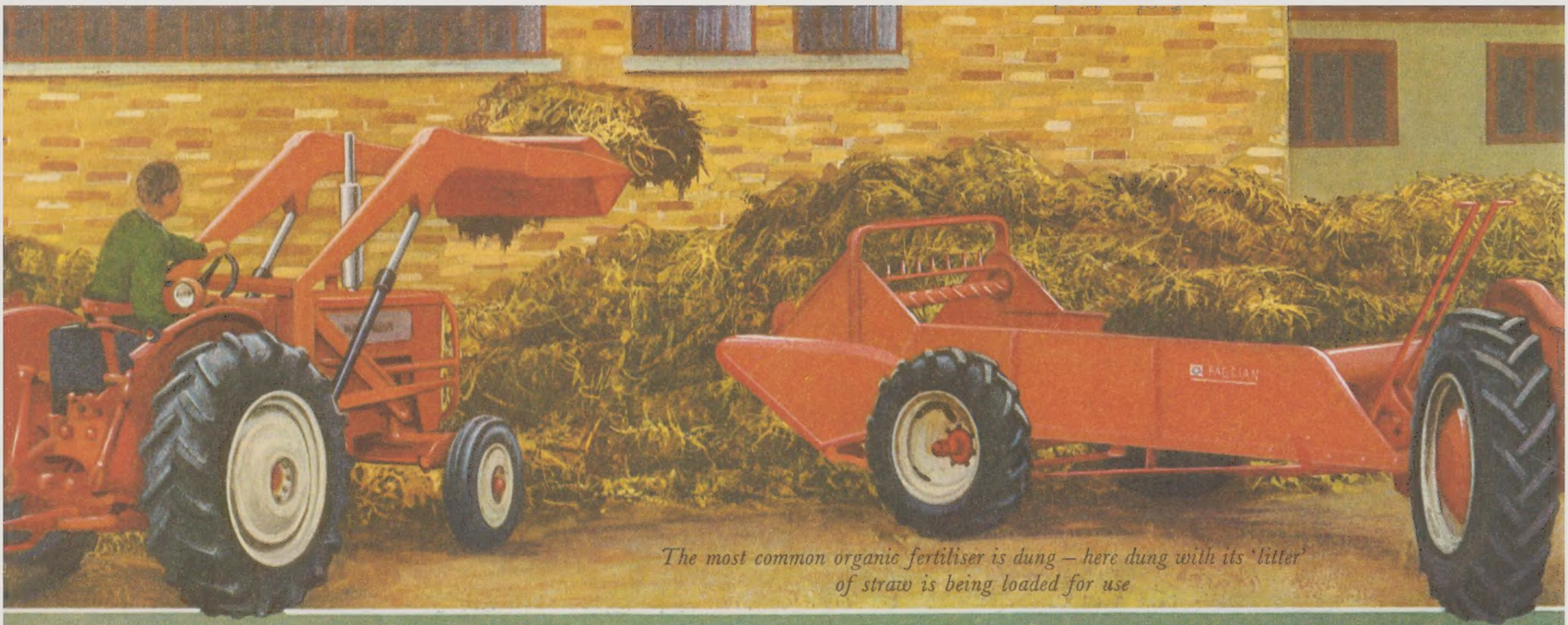
Other major heavy industrial plants include the massive iron and steel combine at Ijmuiden and the tin smelting works at Arnhem, which smelts one-fifth of the world's tin. Light industries, especially those needing skilled labour, are developed in many towns. Precision engineering goods and cut diamonds are produced in Amsterdam; pottery in Delft; drugs in Arnhem; and radios in Eindhoven.

Today the Netherlands depends on trade more than any other country in the world. Since the loss of the Dutch East Indies (now Indonesia) in 1945, the proportion of overseas trade has declined. But the establishment of the Benelux Union and the Common Market has led to a freer exchange of goods with European countries.

In addition the Netherlands' position on the delta of the Rhine, the busiest waterway in Europe, continues to bring the country great benefits from the transit trade, particularly to and from West Germany.

The enormous factories of the Phillips radio and television company at Eindhoven





The most common organic fertiliser is dung – here dung with its 'litter' of straw is being loaded for use

ORGANIC FERTILISERS

WE hear so much about chemical fertilisers, weedkillers, and insecticides that we might wonder how Nature ever got along without them. But in fact Nature has her own methods of fertilising the soil in which her agencies are natural or *organic* substances. Dead leaves which fall to the ground, dead bodies which decay, the droppings of animals – in fact all once-living things which return to the soil decompose there to form, by a chemical process, the soil's life blood. Artificial fertilisers are merely providing in a convenient form what the organic fertilisers have been doing in the course of Nature for millions of years.

On page 2080 we saw how plants need nitrogen, potassium, and phosphorus, and how these elements and certain others must be put back into the soil if we want it to produce good crops. The most common form of organic fertiliser is farmyard manure, or dung; on an average each ton contains only 10 pounds of nitrogen, 8 pounds of potassium, and 4 pounds of phosphorus. This means that enormous quantities of manure would have to be used to provide the soil with enough of these elements. Since it is comparatively easy to provide them in chemical form, why does the farmer bother to use organic fertilisers?

Improving the quality of the soil

The great advantage of organic fertilisers is that they improve the texture of the soil as well as its mineral content. They do this by the creation of *humus*, a soft, blackish substance formed while the organic matter is being broken down by bacteria in the soil to form nitrates. Humus helps to bind sandy soils together and enables them to hold water, while it lightens heavy clay soils so that air and water can penetrate them more freely. Another advantage of humus is that it darkens the colour of the soil, causing it to absorb more heat from the sun.

Farmyard manure

There are two ways of applying organic fertilisers: animal residue can be spread on the ground or plant material can be ploughed back into the soil. The most common form of animal residue is farmyard manure or dung.

Dung consists of the litter and droppings of the farmyard animals. Its mineral content depends on the kind of animal, the food it is given, its age, the kind of litter used (generally straw), and the method of storing the dung. It usually has to be kept for some time, and well-rotted manure is more valuable than fresh manure since the breakdown by bacteria is well under way and the nitrates are becoming available to the plants.

Some dung, like that from poultry and horses, breaks down quickly; it is known as hot manure. Pig and cattle manures, on the other hand, break down slowly, and are called cold manures. Certain crops and certain types of soil benefit more from one type of manure than another.

Other organic fertilisers

There are several other forms of organic fertiliser, and, like manures, some of them break down more quickly than others, making them suitable for different types of crop. They include guano, the droppings, feathers, and remains of sea birds; fish guano, made from fish offal; shoddy, a waste material produced in making woollens, which is used in compound manures and is slow to decay; soot, which is a quick-acting fertiliser and the dark colour of which helps to increase the temperature of the soil; and seaweed, which has been used as a manure for centuries in coastal districts. A number of waste substances can also be used as fertilisers: among them are dried blood, ground hoofs and horns, hair, damaged oil-cakes, and spent hops.

Plants as fertilisers

There are two ways of using plants as fertilisers. The remains of plants which have been harvested can be ploughed back into the land (like stubble left after the grain harvest), or crops can be specially grown for ploughing back. This helps to improve the water-holding quality of light soil; plants used for this purpose include trefoil (clover), white mustard, and Italian rye-grass.

Farmers use a variety of fertilisers – the easily available organic fertilisers and the easily handled chemical fertilisers – in their efforts to replace the elements taken out of the soil by the crops. The care of his soil is one of the farmer's most vital jobs. Unless he drains it, ploughs it, and feeds it, he cannot produce the large crops which are needed to feed the increasing population of the world.

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As late as 1961 it was feared in Washington that the Russians had many more rockets and might be the strongest power at least until 1966. This has proved untrue because the Russian leaders decided that comparatively few big rockets carrying extremely powerful H-bombs, and deliberately aimed at cities, would be enough to deter America. The American ICBM's (Inter-Continental Ballistic Missiles) are: Atlas, Titan, Minuteman, and Polaris (see article on *Warfare*).

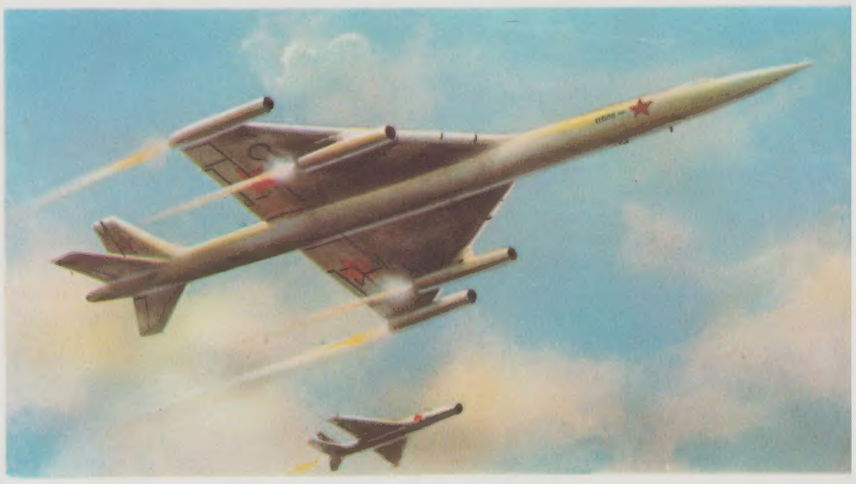
The bombers

The comparison of East-West strength shows that the Russians have built comparatively few long-range bombers, just as they have built few big rockets. This economical strategy is called 'minimum deterrence'.

The Americans, by contrast, had no less than 630 big, eight-jet B.52s operating at the beginning of 1963. Many of them hope to beat anti-aircraft defences by launching two Hound Dog rocket bombs as far as 600 miles away from their targets. They also have 45 B.58 'Hustler' supersonic bombers but no more of these are being built and the projected supersonic B.70 'Valkyrie' will never go into service. This is now the age of the rocket.

The finger on the trigger

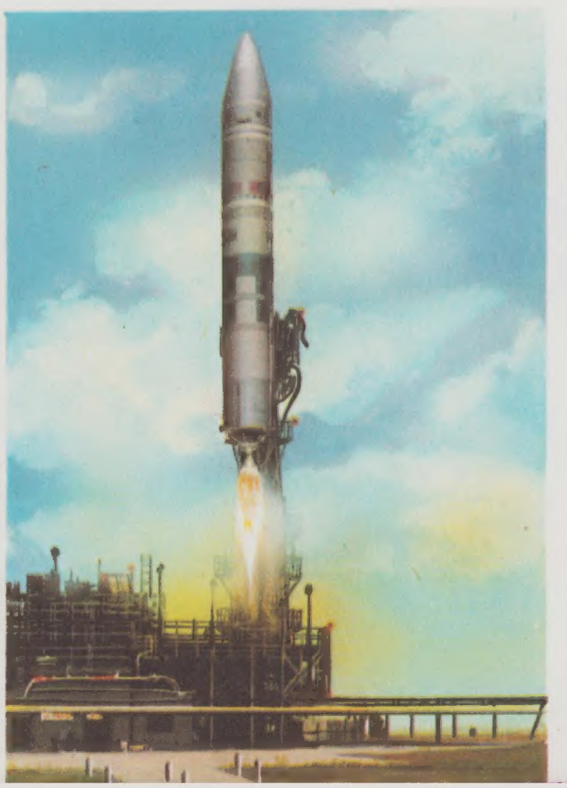
In a world which could be destroyed in a few minutes, the leaders of the big opposing powers have to be able to convince each other that they are too quick on the draw with their nuclear weapons to be taken by surprise. But, for their own safety and the safety of the world, they have to ensure that their hair-triggers could not go off by accident or be pressed by some unauthorised madman. The plans which have been made to meet these two vital needs are among the most elaborate parts of modern defence.

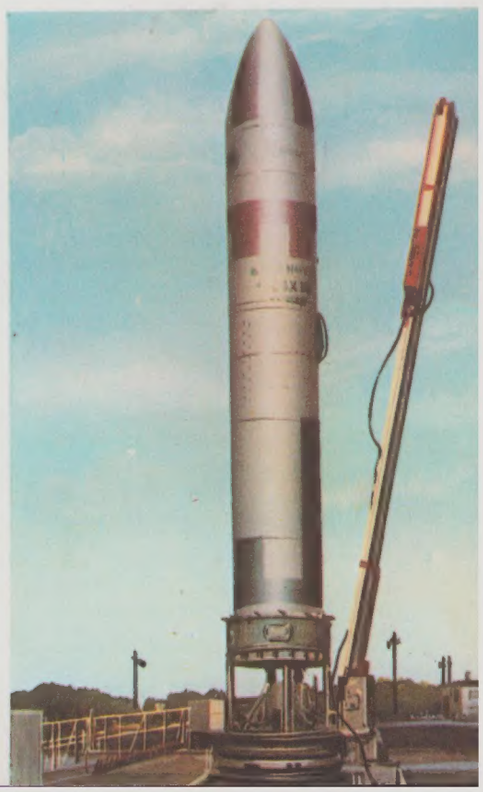


A Russian supersonic 'Bounder' bomber and a 'Fishpot' fighter

In America and Britain there are carefully protected telephone and radio circuits which are always alive. They make a bleeping signal every few seconds as a continuous test. They connect the United States President, through his military commanders, with every bomber, submarine, and rocket site. The commanders can only launch their weapons if they receive a special code signal, which can only be originated by the President, and of which few people know the secret. They also get a key, combination, or code to select their targets, and every weapon requires several men to complete the firing drill so that no

The American family of ICBMs: from left to right the Minuteman, the Titan II, and the A-3 Polaris





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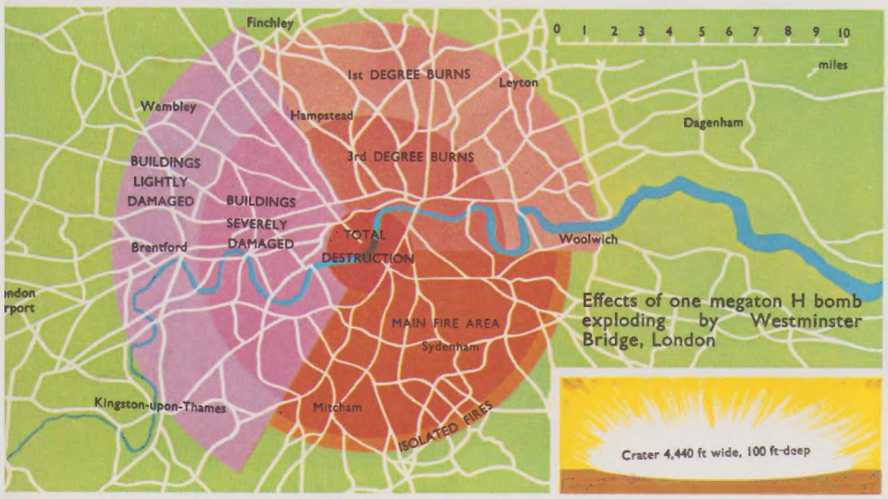

single lunatic could set one off. No doubt Russia has some similar system.

The circuits also connect the President with a warning system through his Air Defence Command which has a vast chain of radar stations always on the watch for incoming rockets or bombers. The Ballistic Missile Early Warning System (BMEWS) has three giant radars looking far out into space over the Arctic and northern Europe from Alaska, Greenland, and Fylingdales Moor in Yorkshire. The radars at Thule in Greenland alone cost nearly £200,000,000. They have three screens, each as big as a football pitch, standing on a high cliff at the edge of the Arctic ice-cap and swept by freezing 100-m p h gales.

The radars watching for bombers are set in a chain across North America above the Arctic Circle called the Distant Early Warning or DEW-line. On either side of the continent, radar picket planes patrol constantly to extend the radar fence out into the Atlantic and Pacific Oceans. Another chain runs down the Iron Curtain from north to south in Europe.

The British Prime Minister shares these warning circuits with the President and has his own links to give attack orders to Royal Air Force Bomber Command headquarters near High Wycombe, Buckinghamshire.

Britain and France

Britain gave up trying to build her own rocket, Blue Streak, as a military weapon in 1960. At an estimated cost of £500,000,000, it was too expensive for a small nation; and, even buried underground, the launch sites were too close to Russia to be safe against surprise attack. Sixty 1,500-miles-range Thor rockets sent from America in 1959 were being dismantled by the end of 1963 because they also were too vulnerable. So, until the first Polaris submarine for the Royal Navy is ready in 1968, the Royal Air Force's famous V-bombers must carry on alone. To do this they have been equipped with the rocket bomb, Blue Steel, which can be launched up to about 100 miles away from a heavily defended target area. The V-bombers also have ingenious, secret devices to confuse enemy radar and to throw anti-aircraft missiles off course. A new twin-jet supersonic bomber, the TSR-2, is being developed. It will fly towards its target at twice the speed of sound and then be able to dive down and fly at tree-top level below the line of sight of enemy radar.

France is expected to have a small force of supersonic Mirage IV bombers by 1964 or 1965 and she is also working to perfect her own nuclear submarines and rockets.

Conventional weapons in a nuclear age

All through the 1950's and even more so today the West, led by the United States, has had greater nuclear power than the Russians. The Americans have so much more than they need to knock out Russia that they have invented a chilling name for their surplus power. They call it 'overkill'. The true figures are secret but scientists have estimated that America has about 30,000 megatons of nuclear explosive and Russia about 1,000–2,000 megatons. This totals more than 10 tons of TNT equivalent for every human being in the world.

Obviously it would be senseless to use nuclear weapons in a local war, or even in 'police' actions to maintain law and order. This is why we need infantry, artillery, tanks, strike planes, and warships in a nuclear rocket age. The table of forces shows, surprisingly, that the West is better off for armed man-power than the East, despite the vast populations of Russia and China. The reason is that it takes advanced industrial power to equip modern forces, and the West's industrial capacity is still two-and-a-half times greater than the Communist countries. The West is still often weaker, however, at points where it faces Communist forces on a land frontier because the Western forces are more thinly spread out around the world and often require vast sea and air movement to concentrate them.

EAST-WEST STRATEGIC STRENGTH

WEAPON	WEST	EAST
ICBMs (Inter-Continental Ballistic Missiles)	450–500	75 plus
MRBMs (Medium Range Ballistic Missiles)	250	700
Long-range bombers	630	200
Medium-range bombers	1,630	1,400
Battleships and carriers	40	nil
Nuclear submarines	32	12
Conventional submarines	212	445
Escort ships	842	124
Tanks	16,000	38,000

EAST-WEST ARMED FORCES MANPOWER:

Total West plus United States Treaty powers	8,010,000
Total Communist bloc	7,670,000